



# Copernicus EMS

Early warning and  
monitoring of wildfire  
danger and floods

Copernicus Emergency Management Service

Samokov – 3 July 2017 - afternoon



*Source: National Institute of Meteorology and Hydrology BAS Bulgaria  
Report on floods in 2017*

Monday, 03 July 2017 11:52

## EFAS Flood Notification - Type: Informal\*

Country(ies): **Bulgaria and Romania**

River(s): **Danube, section Olt - Yantra (Danube basin)**

Predicted start of event: **Monday 3rd of July 2017**

Earliest predicted peak: **Wednesday 5th of July 2017**

Probability to exceed a 5-year return period magnitude: **80%**

Probability to exceed a 20-year return period magnitude: **61%**

Forecast date: **2017-07-03 00 UTC**

Comment: This EFAS Flood Notification is only informal due to the the short forecast lead-time (< 48 hours).

Monday, 03 July 2017 05:32

## EFAS Flash Flood Notification\*

Country(ies): **Bulgaria**

Region(s): **Montana Region**

Earliest predicted peak: **Monday 3rd of July 2017 18:00**

Percent of affected area susceptible to landslides: very high **9%**, high **15%**, moderate **18%**

Forecast date: **2017-07-02 12 UTC**

Comment: -



## Increasing threats for Europe

- **Climate change** is amplifying the impacts of extreme weather events in Europe and worldwide. Recently, **tropical cyclones** severely affected the EU outermost regions and the European overseas territories in the Caribbean. **Hurricane Ophelia** caused flash floods in Ireland and the United Kingdom and affected large parts of North-western Europe. Deadly severe storms following intense heat waves hit Central Europe earlier this summer.
- Over one million hectares of wildland areas destroyed by **wildfires in Europe** in 2017, an area four times the size of Luxembourg and over ten times the size of Berlin.
- Destruction of property and **major impacts on the economy** including to network infrastructure, businesses, agricultural and forestry activities. Over **100 people killed** only in Portugal

Source: Strengthening EU Disaster Management - rescEU Solidarity with Responsibility (COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL AND THE COMMITTEE OF THE REGIONS)

# Preparedness and prevention are crucial

Increase the relevance, effectiveness, efficiency and coherence of the Union Civil Protection Mechanism (UCPM) by

1 € spent in  
prevention saves up  
to 7 € during  
response



## The Copernicus Emergency Management Service components

### Risk and Recovery Mapping

Delivery of maps within weeks or months to support recovery, disaster risk reduction, prevention, and preparedness



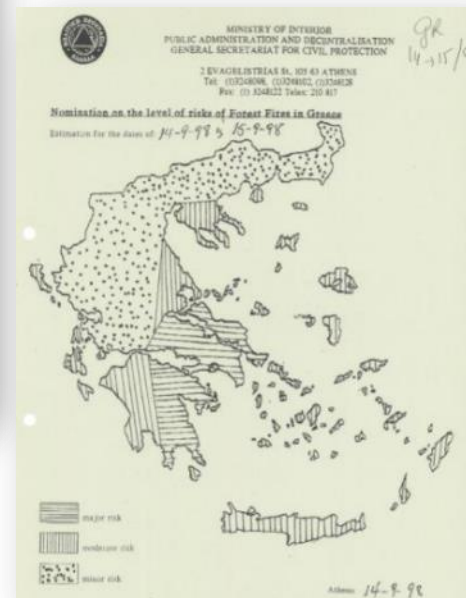
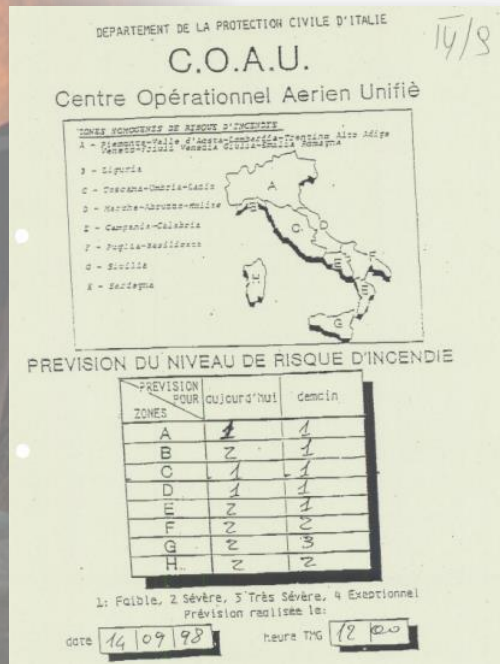
### Rapid Mapping

Delivery of maps soon immediately following a catastrophic events

### Early Warning & Monitoring

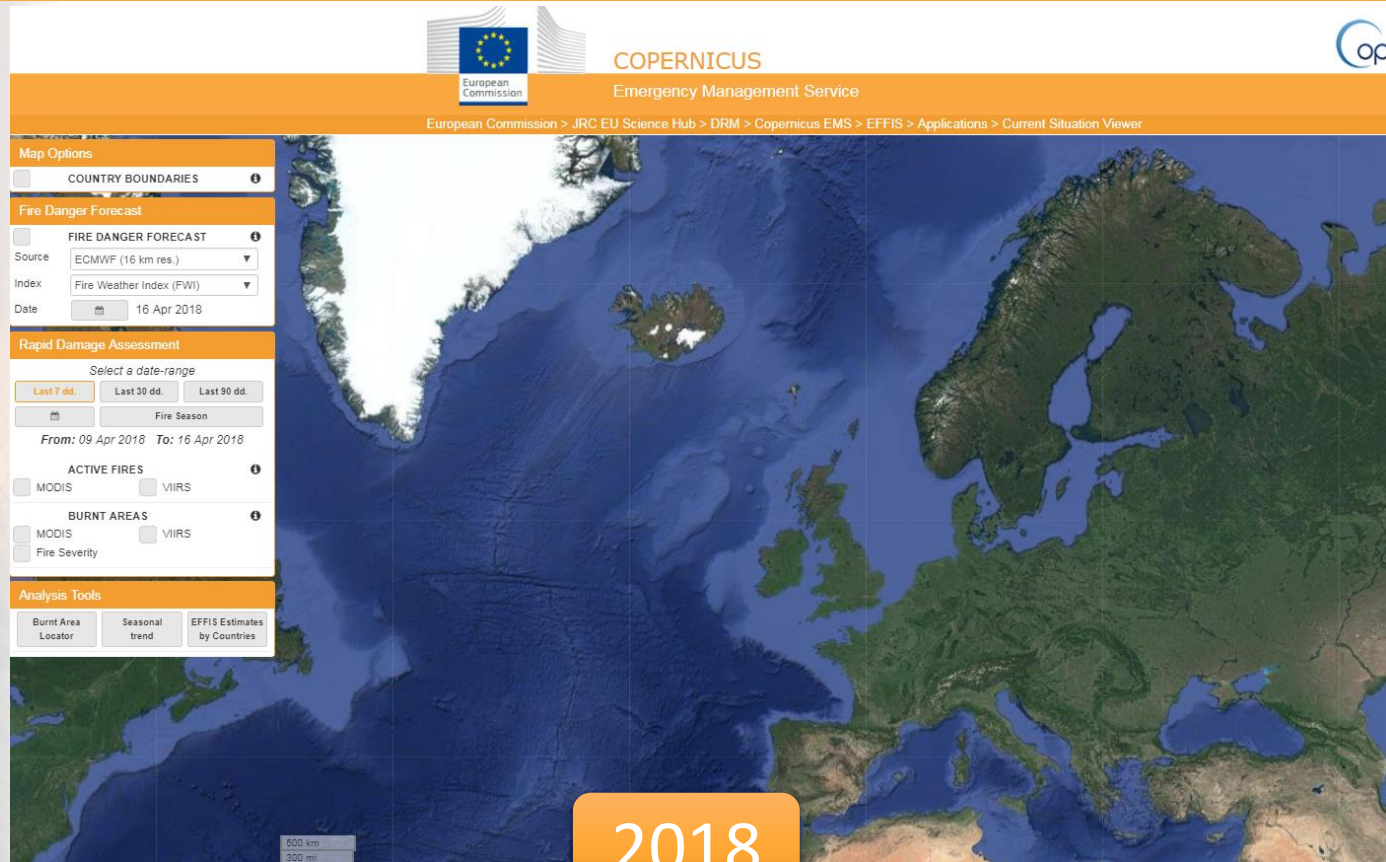
Flood alerts, wildfire danger predictions and near-real time monitoring of wildfire impacts

# The long road towards a Europe that protects



1998

# EFFIS - current status 2018



2018

Company General Use





Emergency  
Management

# EFAS – the European Flood Awareness System

2002

**Elbe and Danube floods.** The European Commission commits to support flood management activities

2003

National authorities and scientific communities build a **partner network**, to collect meteorological and hydrological data. The European Flood Alert System is launched

2004

**Collaboration agreement** with the European Centre for Medium-Range Weather Forecasts (ECMWF) to use the ensemble prediction

2007

EFAS becomes **operational**

2010

Daily dissemination of results to the **European Civil Protection**

Company General Use

# The long road towards a Europe that protects



COPERNICUS

Emergency Management Service



LATEST NEWS : 2018-02-27 | Copernicus Emergency Management Service Monitors the Impact of Floods in Greece

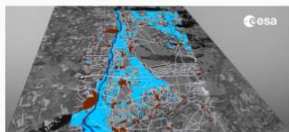
## Copernicus Emergency Management Service

Copernicus Emergency Management Service (Copernicus EMS) provides information for emergency response in relation to different types of disasters, including meteorological hazards, geophysical hazards, deliberate and accidental man-made disasters and other humanitarian disasters as well as prevention, preparedness, response and recovery activities. Three modules constitute the Copernicus EMS:

### Copernicus EMS - Mapping

The Copernicus EMS - Mapping addresses, with worldwide coverage, a wide range of emergency situations resulting from natural or man-made disasters. Satellite imagery is used as the main datasource. The service covers in particular:

- Floods
- Tsunamis
- Earthquakes
- Landslides
- Fires
- Severe Storms
- Volcanic eruptions
- Technological disasters
- Humanitarian crises



0:00 / 1:22

Copernicus EMS - Mapping

### European Flood Awareness System

The European Flood Awareness System (EFAS) is the first operational system that monitors and forecasts flood events across Europe. It provides its partners (national/regional authorities, as well as the European Commission's Emergency Response Coordination Centre) with a wide range of complementary, added value flood early warning information including related risk assessments up to 10 days in advance.



European Flood Awareness System

### European Forest Fire Information System (EFFIS) and Global Wildfire Information System (GWIS)

The European Forest Fire Information System (EFFIS) monitors forest fire activity in near-real time and archives historical information on forests fires in Europe, Middle East and North Africa. The Global Wildfire Information System (GWIS) is a joint initiative of the Copernicus EMS and the Group on Earth Observations (GEO) work programs aiming at monitoring wildfire occurrence and impact at the global level. Both, EFFIS & GWIS, support wildfire management at national, regional and global levels.



Access to EFFIS and GWIS application is available at:

EFFIS and GWIS Systems

# The EFFIS network

- Experts on forest fires meeting in Spring and Autumn before and after the fire season to **improve forest fire prevention** in Europe and Med countries
  - **40 european Countries** , international organizations such as FAO, and EC Services
- Slovakia is represented by the **National Forest Centre/Forest Research Institute**



## Current situation



**Fire Danger Forecast:** daily maps of 1 to 10 days of forecasted fire danger level using numerical weather predictions



## Current situation



**Active Fires Detection:** fires are located by comparing the temperature of a potential fire with the temperature of the land cover around.

Hot Spots are detected using MODIS/VIIRS and Sentinel2&3

## Current situation



**Rapid Damage Assessment:** daily update of the perimeters of burnt areas in Europe for fires of about 30 ha or larger, providing location, fire duration, total burnt area and land cover affected

## Active fire detection



Active fire detection in Cyprus June 1<sup>st</sup> – September 31<sup>st</sup>

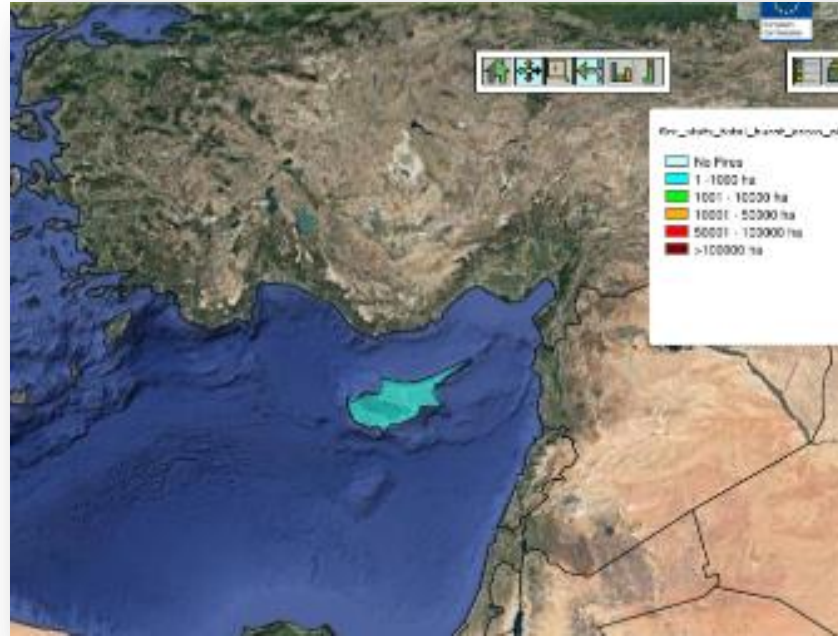
## Post fire assessment- fire severity

- Fire severity: based on the Relative Difference Normalized Burn Ratio (Miller et al. 2009)
- Under development:
  - Post-fire vegetation regeneration to assess the vegetation recovery in a time series of images
  - Post-fire soil erosion risk to assess the potential soil loss





## Fire history




Build customized historical fire maps by querying the European Fire Database on number of fires, average burned area size in a selected year

# Fire news

**Fire News**

Find a location



Search by:  From:  To:

Country	Place	Date	Size	Severity	News
Germany	Brandenburg	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item
France	Charente-Maritime	2017-05-27	1000000 m²	High	1 News item

Daily updates wildfire related news from Internet in all EU languages  
News are geo-located and can be easily browsed by date, size, country

# EFFIS tools - seasonal trend of number of fires

## EU countries

 Total EU

 Belgium

 Bulgaria

 Croatia

 Cyprus

 Czech republic

 Denmark

 Estonia

 Finland

 France

 Germany

 Greece

 Hungary

 Ireland

 Italy

 Latvia

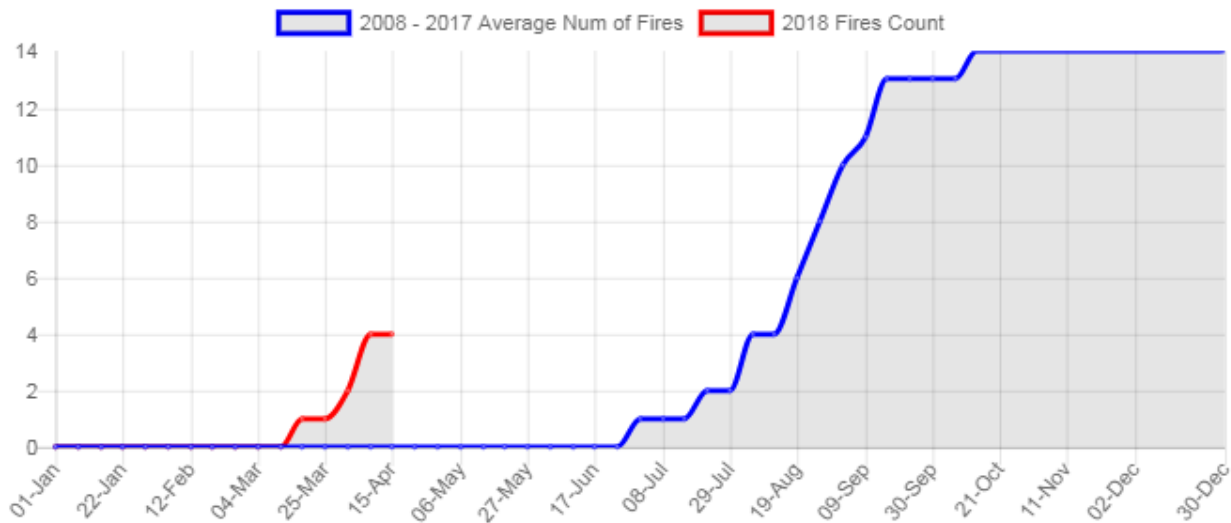
 Poland

## Burnt Areas

## Number of Fires



## SEASONAL TREND - Bulgaria

Numbers of Fires mapped in EFFIS (of approx. 30 ha or larger)



Period	2018 Fires Count	2008 - 2017 Average Burnt Areas
01-Jan	0	0
08-Jan	0	0

# The long road towards a Europe that protects



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Emergency Management Service

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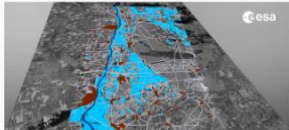
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0:00 / 1:22

Copernicus EMS - Mapping

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EFFIS and GWIS Systems

# 2018

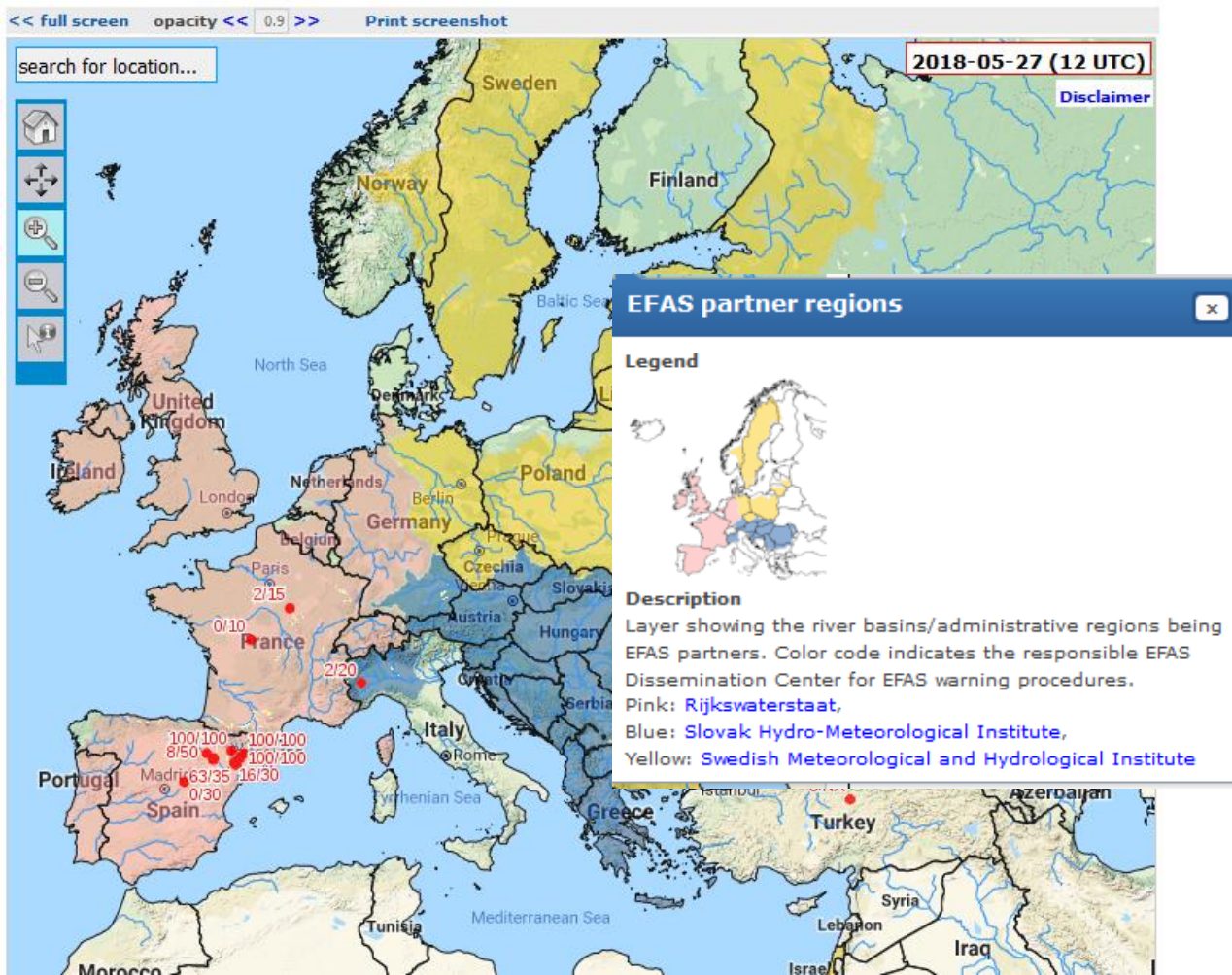
Company General Use



## The EFAS partners

- EFAS partners are regional or local authority having a role in flood risk management such as national **hydro-met or civil protection services**
- EFAS partners sign a condition of access (CoA), and then **get access to real time services** and products through the EFAS Information System (EFAS-IS): [www.efas.eu](http://www.efas.eu)
- Currently **62 authorities are EFAS partners**
  - Slovakia is represented by the **SHMI (Slovak Hydrometeorological Institute)**





SHMI (Slovak Hydrometeorological Institute) is part of the operational EFAS Dissemination Centre

- providing hydrological forecasts twice-daily across Europe
- disseminating EFAS notifications to the respective national contact institute



## + Flood summary layers (3/11)

Information on current and past floods situation: active information on alert areas, flood forecasting, flood probability and real time hydrographs, event-based impact assessment and inundation mapping.

## + Hydrological layers (0/6)

Forecasts based on different meteorological deterministic and ensemble models

## + Flash flood layers (0/2)

Flash flood forecasts are generated using the methodology of the Enhanced Runoff Index based on Climatology, whereas flash flood nowcast is based on the propagation of radar data.

## + Init. Conditions layers (0/11)

Maps such as the simulated soil moisture or snow water equivalent and associated anomalies, which are important background information when analysing flood forecast

## + Meteorological layers (0/8)

Accumulated rainfall and EFAS forecast consisting in:

- deterministic medium-range forecasts
- global model from DWD (German Weather office) and ECMWF
- ensemble forecast for flood warning times beyond 48 hours, from ECMWF and Consortium for Small-scale Modeling (COSMO)



# EFAS products

## 1. Probabilistic flood forecasts

### Main characteristics:

- for whole of Europe
- 10 day lead time
- 5\*5km resolution
- twice a day updated

EFAS forecasting

Service OK

>> normal view opacity << 0.9 >> Print screenshot

search for location...

Select layers

2016-05-28 12 UTC

Flood summary layers (3/14)

☐ EFAS active information

☐ National Flood Monitoring

☐ Rapid Flood Mapping

☐ Rapid Impact Assessment

☐ Alert Level Exceed. ongoing

☐ Alert Level Exceed. 1-2 days

☐ Alert Level Exceed. 3-5 days

☐ Alert Level Exceed. 6-10 days

☐ Alert Level Exceed. 11-15 days

☒ Reporting Point

☐ Reporting Point

☐ Flood Probability

☐ Flood Probability

☐ Flood Probability

☐ Flood Probability

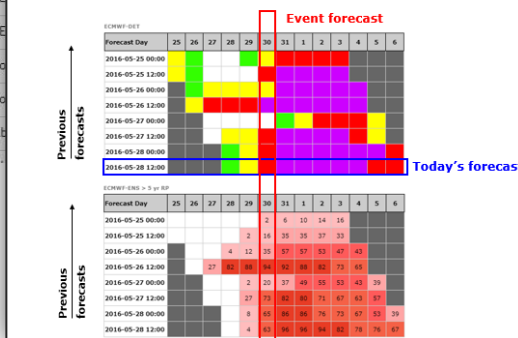
☐ Flood Probability

☐ Flood Probability

☐ Flood Probability

☐ Flood Probability

Threshold exceedance

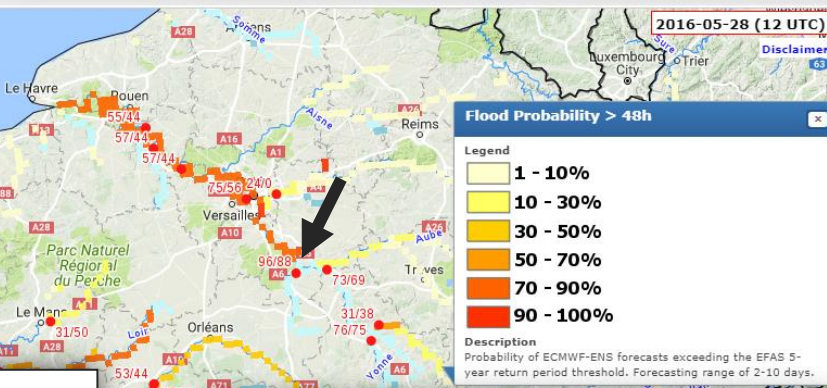


Point Information

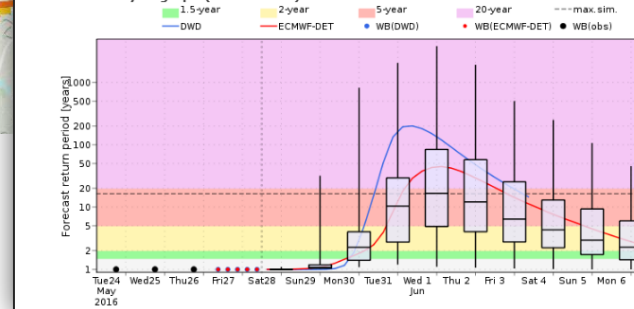
	Country	CoA Status	Basin	River	Upstream Area [km2]	PointID	Lat [Deg]	Long [Deg]
Point Forecast	France	YES	Risle,Seine	Loing	4,000	21	48.33	2.77

Point Forecast

	Forecast Date	Probability value	Probability tendency	Peak forecasted in:
Point Forecast	2016-05-28 12:00	98		2016-05-28 12:00 + 4 days



Return Period Hydrograph (ECMWF-ENS)





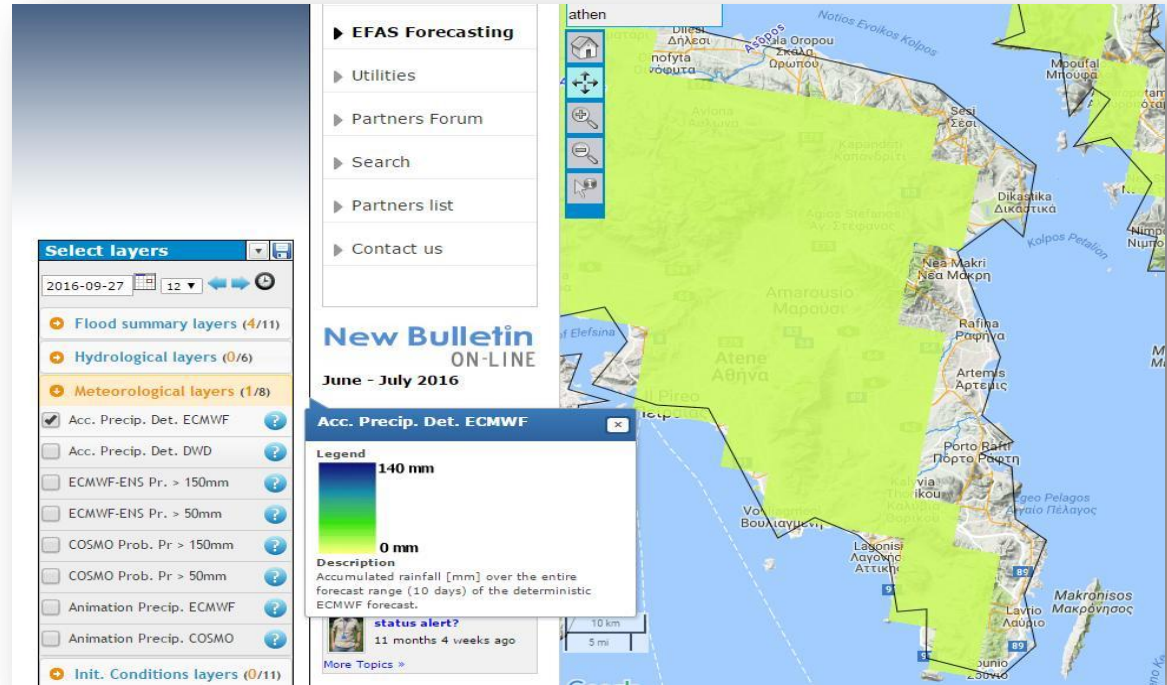
## 2. Meteorological forecasts

- **Deterministic forecasts**

- DWD (ICON & ICON-EU) – global model, 7 forecast days (~ 6.5 km, day 1-3 ~ 13 km, day 4-7)
- ECMWF – global model, 10 forecast days, ~ 9 km

- **Ensemble forecasts**

- ECMWF VAREPS – global model, 51 members, 10 forecast days, ~18 km
- COSMO-LEPS – Europe, 16 members, 5 forecast days, ~ 7 km



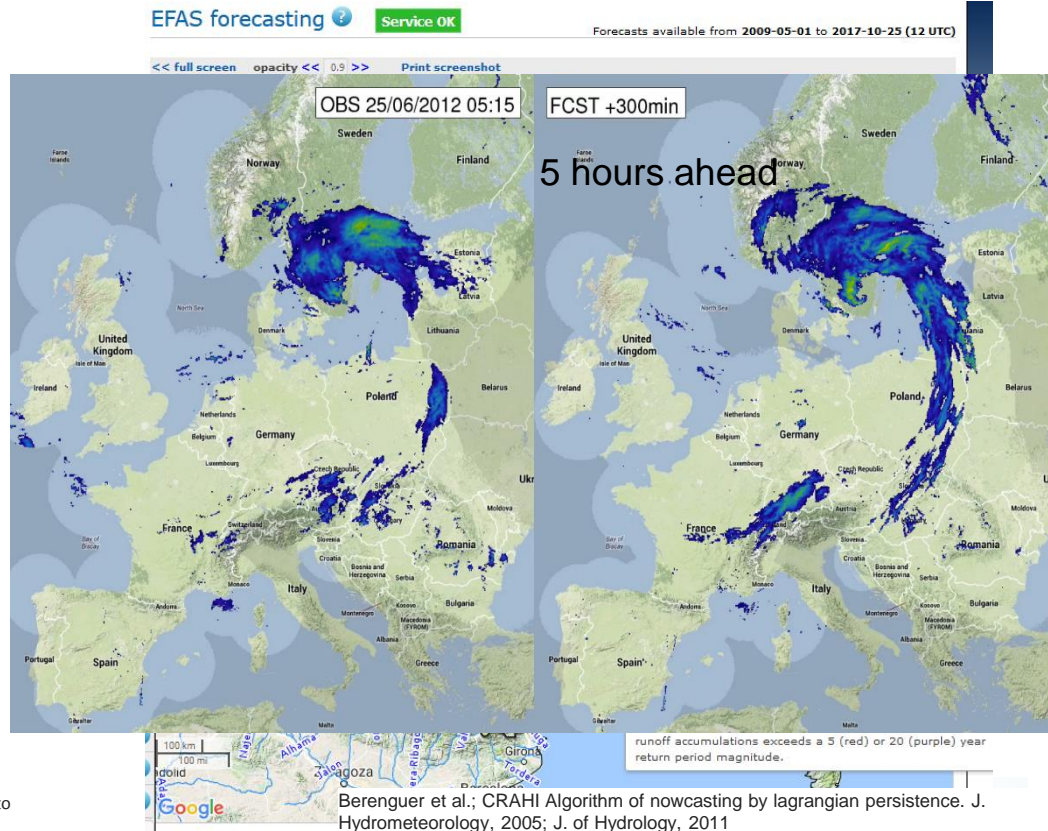
## 3. Flash flood

### Forecasting, ERIC indicator

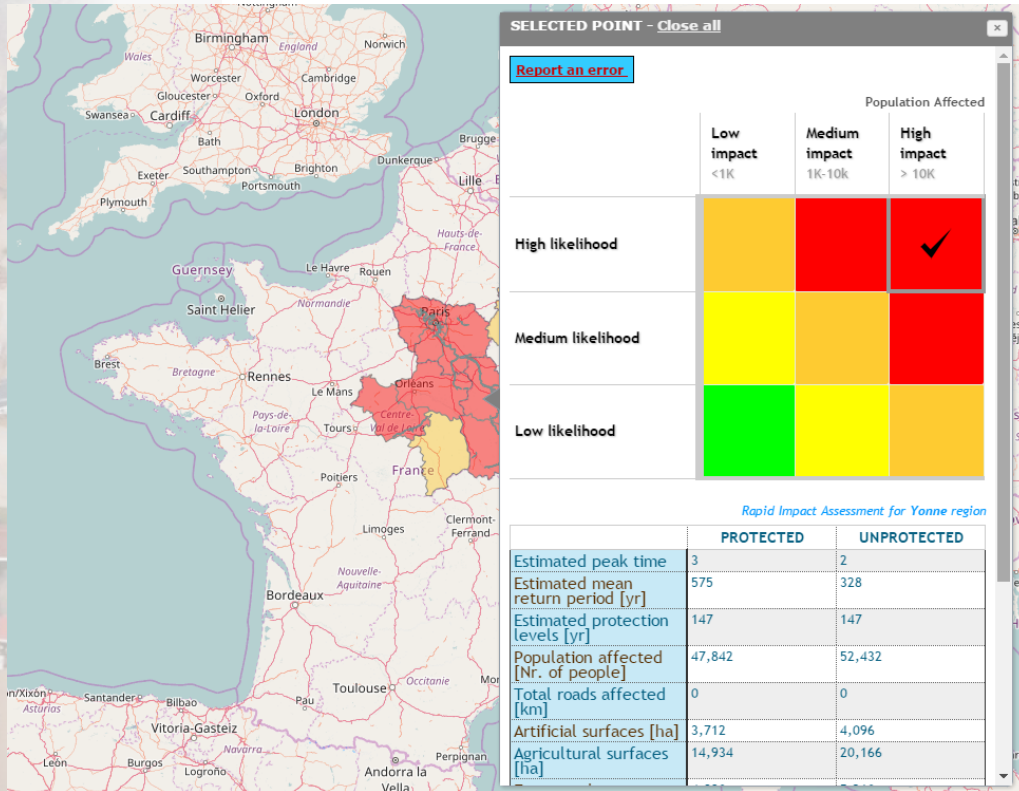
- Based on forecast accumulated upstream precipitation for durations up to 24 hours (no hydrological simulation)
- Cover river network at 1 km resolution for catchments between 25-2000km<sup>2</sup>  
Probabilistic return period shown for lead time range 12-120 hours

### Nowcasting, ERICA indicator

- Integrating OPERA radar data into EFAS
- Near real time monitoring of radar based precipitation plus nowcasting
- Flash flood hazard indicator based on the radar data precipitation



## 4. Rapid flood hazard assessment



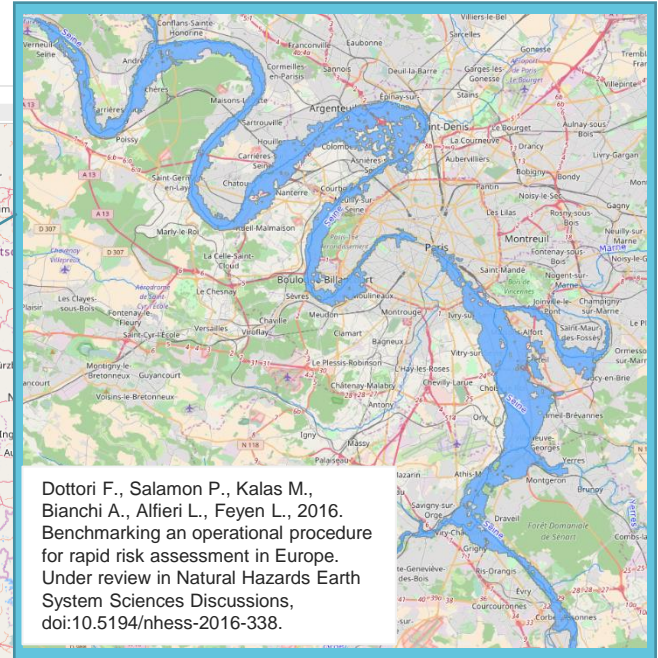
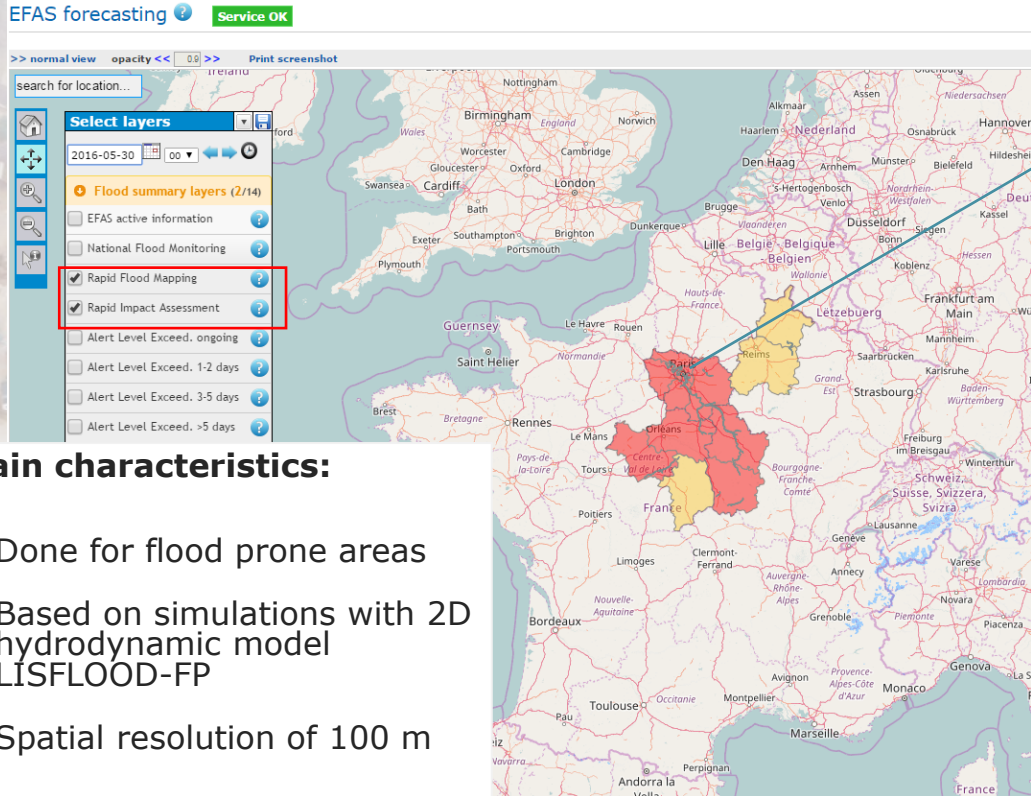
### Main characteristics:

- Done twice a day, based on EFAS probabilistic flood forecast
- Provides a flood hazard assessment on the fly using pan European exposure datasets
  - Affected population [no. of people]
  - Affected roads [km]
  - Surfaces (urban, agriculture and forest) affected [ha]
  - Potential monetary damage [M €]
  - Cities affected

	HIGH	MEDIUM	LOW
Impact	>10k	1k-10k	<1k
Likelihood	<48hours	2-6 days	>6days



## 6. Event-based flood inundation mapping



### Main characteristics:

- Done for flood prone areas
- Based on simulations with 2D hydrodynamic model LISFLOOD-FP
- Spatial resolution of 100 m



## How can I access EFFIS?

- EFFIS data and application freely accessible Web-GIS at:  
<http://forest.jrc.ec.europa.eu/effis/>
- WMS are available at  
<http://forest.jrc.ec.europa.eu/effis/applications/data-and-services/>
- Get additional support to access data which are no more available through the EFFIS web services (e.g. historic data, extracts of the fire database, or raw burned area perimeters) can be asked.



## How can I access EFAS?



- To access the EFAS-IS go to [www.efas.eu](http://www.efas.eu)
- Personal login is required to access forecasts and notifications
- To contact the EFAS team please email [info@efas.eu](mailto:info@efas.eu)